

Air pollution associated with increased heart attack risk despite 'safe' levels

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Particulate matter and NO₂ air pollution are associated with increased risk of severe heart attacks despite being within European recommended levels, according to research presented at ESC Congress today by Dr Jean-Francois Argacha, a cardiologist at University Hospital Brussels (UZ Brussel-Vrije Universiteit Brussel), in Belgium.

"Dramatic health consequences of air pollution were first described in Belgium in 1930 after the Meuse Valley fog," said Dr Argacha.

"Nowadays, the World Health Organization (WHO) considers air pollution as one of the largest avoidable causes of mortality. Besides the pulmonary and carcinogenic effects of air pollution, exposition to air pollution has been associated with an [increased risk](#) in cardiovascular mortality."

"In addition to the long term consequences, more recent research suggests that acute exposure to air pollution may trigger some cardiovascular events such as strokes, heart failure or myocardial infarction (heart attack)," continued Dr Argacha. "Myocardial infarction covers a number of clinical conditions and the effect of pollution on these subsets is unknown."

The current study investigated the effect of short term exposure to air pollution on the risk of ST-segment elevation myocardial infarction (STEMI). This type of [myocardial infarction](#) has the worst prognosis and is caused by thrombotic occlusion of a coronary artery that damages the heart.

Ambient air pollution is a mixture of particulate matter (PM) and gaseous pollutants such as sulfur dioxide (SO₂), nitric dioxide (NO₂) and ozone (O₃). Fine particle pollution, also called PM_{2.5}, has the ability to reach the lower respiratory tract and carry a large amount of toxic compound into the body. PM_{2.5} and NO₂ originate predominantly from the combustion of fossil fuels such as emissions from industrial plants or vehicles.

Data on PM₁₀, PM_{2.5}, O₃ and NO₂ levels were obtained from Belgian Environmental Agency air pollution records. A statistical model called RIO was used to provide a real-time evaluation of air pollution exposure in each part of Belgium with adjustments for population density. Data on STEMI incidence came from the Belgian Interdisciplinary Working Group on Acute Cardiology (BIWAC) STEMI registry, using STEMI hospitalisation as a proxy indicator. The relationship between pollutants and STEMI was assessed using a case-crossover design and performed by the biostatistics department of Université Libre de Bruxelles (ULB), Brussels, Belgium.

Between 2009 and 2013, there were 11 428 hospitalisations for STEMI. The researchers found that 10 µg/m³ increases in ambient PM_{2.5} concentrations were associated with a 2.8% increase in STEMI while 10 µg/m³ rises in NO₂ were associated with a 5.1% increased risk (Figure 1). These associations were only observed in men.

"The association between STEMI and air pollution was observed within one day of exposure," said Dr Argacha. "This was despite the fact that concentrations of [air pollutants](#) were within the European air quality standard. It's possible that only men were affected because of the under representation of women in our study population (less than 25%). Nevertheless, previous studies have demonstrated that blood pressure, arterial stiffness and heart rate variability abnormalities secondary to air pollution exposure are more pronounced in men. Sex differences in

obesity and blood inflammation may worsen air pollutant effects but this hypothesis requires further investigation."

A subgroup analysis according to age showed that patients aged 75 years and above developed more STEMI in relation to PM10 exposure, while those 54 years and under were more susceptible to NO₂. Dr Argacha said: "Considering that NO₂ is more related to vehicle emissions, one explanation for this finding could be that the younger population may be exposed to excess NO₂ from road traffic due to a higher level of social and professional activities."

He concluded: "This is the first study to examine the effect of air pollution on STEMI occurrence at a national level using a prospective observational registry of unselected patients. We found that particulate and NO₂ air pollution, at levels below European limits, are associated with an increased risk of STEMI. The detrimental impact of NO₂ exceeds that of fine particles and raises new public health concerns."

More information: Dr Argacha will present the abstract 'Particulate matter and NO₂ air pollution trigger ST-elevation myocardial infarction: a case cross over study of the Belgian STEMI registry'

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